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By: [signature] Date: 11/5/01
Daniel P. Burke, Esq.

PATENT
(117-19)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT	:	WALTER A. JOHANSON
SERIAL NO.	:	09/917,336
FILED	:	JULY 27, 2001
FOR	:	LIGHT TUBE SYSTEM FOR DISTRIBUTING SUNLIGHT OR ARTIFICIAL LIGHT SINGLY OR IN COMBINATION

PRELIMINARY AMENDMENT

Hon. Commissioner of Patents
and Trademarks
Washington, D.C. 20231

Dear Sir:

Preliminary to the initial Office Action, please amend the above-identified application as follows:

IN THE SPECIFICATION:

Please amend the specification as follows:

Paragraph 2, page 10 and 11 and 12:

FIG. 4 illustrates a preferred arrangement for collecting, concentrating and recollimating sunlight comprising in large concave parabolic reflector 110, a large convex parabolic reflector 120, the back end of which forms a small parabolic reflector 111 and a smaller convex reflector 121. The large concave parabolic reflector 110 and large convex parabolic reflector 120 are positioned to share a common focal point. Similarly, smaller concave parabolic reflective surface 111 and small convex parabolic reflector 121 also share a common focal point. This preferred sunlight concentrator advantageously minimizes the amount of lost sunlight which is blocked by the non-reflective side of reflector 20 shown in FIG. 1. In the embodiment shown in FIG. 4, the sunlight striking parabolic reflector 110 is directed to concave reflector 120 and then reflected as a concentrated, collimated beam of sunlight through center hole 115 in parabolic reflector 110 and to the distributor system. Similarly, sunlight striking parabolic reflective surface 111 on the back of reflector 120 is directed to reflector 121 which then directs that sunlight as a collimated concentrated beam through the center hole of parabolic reflector 120 and to the light distributing system. This preferred light concentrator also comprises sunlight detectors 116 which are used to maintain the proper orientation of the sunlight concentrator in order to maximize the amount of sunlight striking the parabolic reflectors 110 and 111. It is

preferable to have at least three and possibly more sunlight detectors 116 at spaced positions around the periphery of the support for parabolic reflector 110. Sunlight detectors 116 are preferably linked to suitable controls for affecting the movement of the entire sunlight concentrator, i.e., the precise controls, linkages, computer hardware software.

FIG. 5 illustrates one preferred embodiment of the present invention in the form of a hybrid lighting system which utilizes natural sunlight and/or artificial light at any given time. This illustrated embodiment includes the sunlight concentrator of the type shown in FIG. 4. The sunlight concentrator is connected to two elbows each comprising a reflector. Upper elbow 70 receives light directly from the sunlight concentrator and comprises a planar reflector, e.g. a mirror 71 which reflects incoming sunlight at an angle of 90 degrees. Reflector 71 can be rectangular or oval, or any other desired shape which adequately reflects sunlight received from the sunlight concentrator. Upper elbow 70 is advantageously rotatable about axis **A-A** and is controlled by motor 75 and suitable linkages. The linkages can be belts, gears or other linkages as desired. Light exiting upper elbow 70 enters lower elbow 80 which is rotatable about axis **B-B**. Lower elbow 80 comprises a reflective surface such as a mirror which redirects the incoming sunlight downwardly through tube section 89 and through the roof. While the illustrated embodiments show natural sunlight being directed through a roof, this is solely for purposes of illustration. The advantages of the present invention can be enjoyed with systems that direct sunlight outside of a building or into other areas where illumination is desired. Lower elbow 80 is also advantageously rotatable around axis B-B and is

controlled by motor 85 which is linked to lower elbow 80 by suitable linkage. The combined effect of the rotation of upper elbow 70 and lower elbow 80 permits the sunlight concentrator to track the sun through any position in the sky while always directing the sunlight down tube 89. In this illustrated embodiment tube 89 directs the concentrated sunlight through roof 88 into a light blender. Tube 98 can, for example, be formed of a structural material such as aluminum and preferably has an internal surface which is highly reflective.

Page 14, paragraph 2:

Fig. 13 is a portion of a blender box. The circle on the right is the connector 105 to an artificial light source 95. This connector 105 holds a light baffle 99 which reflects light back into the bulb in order to prevent the element in the light distributor tube. This light baffle 99 is particularly useful when using distributor tubes of the type shown in U.S. Patent No. 6,014,489 which comprise a gradually tapering light distributor for reflecting light out of the distributor tube. Figs. 34a through 34d provide a representation of a light distributor tube 800 connected to an artificial light source 810 by a silicone ring 805. Figs. 34b, 34c and 34c are cross-sectional views taken along lines BB, CC and DD, respectively. These cross-sectional views show the relatively increasing cross-section of light distributor 820 of this illustrated embodiment as the light distributor gradually intersects more of the light beam along the length of the distributor tube 800 as the light beam travels away from the artificial light source 810. The baffle 99 is designed to prevent the heat from the artificial light source from overheating or burning the distributor 820 if this type of light

distributor tube is utilized. Other shapes and sizes of baffles can be utilized without departing from the scope of the present invention in order to accommodate different sizes and shapes of light distributors and/or light distributor tubes.

Paragraph 3, page 19:

Fig. 26 illustrates another device for collimating light from an artificial light source comprising an elliptical reflector 271 and a parabolical reflector 272. According to this embodiment of the present invention, the illuminated arc of the light source is positioned at the first focal point 273 of the elliptical reflector and the parabolical reflector is positioned such that its focal point is common with the second focal point 274 of the elliptical reflector. In the manner illustrated in Fig. 26, light emanating from the arc at the first focal point 273 which strikes the interior reflective surface of the elliptical reflector 271 passes through the second focal point 274 of the elliptical reflector/parabolical reflector, then strikes the interior surface of the parabolical reflector and exits as a collimated beam of light. Fig. 27 illustrates this improved artificial light source connected to a light distributor tube.

Second paragraph, page 20:

Figs. 28 and 29 illustrate another aspect of the present invention which is designed to improve the even distribution of light from an artificial light source. When light is directed from a simple parabolic reflector such as the one shown in Fig. 29 connected

to a light distributor tube, in the area immediately next to the light source, it is common to have intensity peaks. It has been found that a more even distribution of light emanating from the light distributor tube can be obtained by adding a mirror film 282 to the end of the light distributor tube proximate the artificial light source in the manner illustrated in cross-section in Fig. 28. This cross-sectional view of a light distributor tube section comprises a rigid polycarbonate clear tube 283. The mirror film 282 extends only from the point proximate **D** artificial light source or about 30 inches. <u>The mirror film is bonded to a lexan suede film 284. In the same manner, beyond the mirror film, a 3M light enhancement film designated 3635-100, is bonded to the same lexan suede film 284. Distributor 285 is not covered with inner lexan HP92W film 281.</u> Light is emitted from this distributor tube in the area designated by the arc **E** at the bottom of the tube. Light is emitted from this distributor tube in the area designated by the arc E at the bottom of the tube.

Paragraph 2, page 22:

While the illustrated embodiments of the present invention show beams of sunlight passing generally vertically through the roof of a building, it is also within the scope of the present invention to pass sunlight through a roof on an angle. The embodiment of the present invention shown in Fig. 33 is similar to the embodiment shown in Fig. 30 wherein a pivotal and rotatable reflector 710 reflects light to a large parabolic reflector 730 and into a smaller parabolic reflector 740 which then sends the resulting collimated, concentrated beam of sunlight through the roof 701 on an angle into the building where it

encounters reflector 750 and is then directed into either light distributor tubes or blender boxes for possible mixing with artificial light.

CONCLUSION

The present amendments to the specification correct several clerical errors and places the application in better form for review on the merits. Therefore, entry of the present amendment is respectfully requested.

Respectfully submitted,

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REVISED SPECIFICATION
"VERSION WITH MARKINGS TO SHOW CHANGES MADE"

Paragraph 2, page 10 and 11 and 12:

FIG. 4 illustrates a preferred arrangement for collecting, concentrating and recollimating sunlight comprising in large concave parabolic reflector 110, a large convex parabolic reflector 120, the back end of which forms a small parabolic reflector 111 and a smaller **[**concave**]** <u>convex</u> reflector 121. The large concave parabolic reflector 110 and large convex parabolic reflector 120 are positioned to share a common focal point. Similarly, smaller concave parabolic reflective surface 111 and small convex parabolic reflector 121 also share a common focal point. This preferred sunlight concentrator advantageously minimizes the amount of lost sunlight which is blocked by the non-reflective side of reflector 20 shown in FIG. 1. In the embodiment shown in FIG. 4, the sunlight striking parabolic reflector 110 is directed to concave reflector 120 and then reflected as a concentrated, collimated beam of sunlight through center hole 115 in parabolic reflector 110 and to the distributor system. Similarly, sunlight striking parabolic reflective surface 111 on the back of reflector 120 is directed to reflector 121 which then directs that sunlight as a collimated concentrated beam through the center hole of parabolic reflector 120 and to the light distributing system. This preferred light concentrator also comprises sunlight detectors 116 which are used to maintain the proper orientation of the sunlight concentrator in order to maximize the amount of sunlight striking the parabolic reflectors 110 and **[**120**]** <u>111</u>. It is preferable to have at least three and possibly more sunlight detectors 116 at spaced positions around the periphery of the support for parabolic reflector 110. Sunlight detectors 116 are preferably linked to suitable controls

for affecting the movement of the entire sunlight concentrator[.], i.e., [T] the precise controls, linkages, computer hardware software.

FIG. 5 illustrates one preferred embodiment of the present invention in the form of a hybrid lighting system which utilizes natural sunlight and/or artificial light at any given time. This illustrated embodiment includes the sunlight concentrator of the type shown in FIG. 4. The sunlight concentrator is connected to two elbows each comprising a reflector. Upper elbow 70 receives light directly from the sunlight concentrator and comprises a planar reflector, e.g. a mirror 71 which reflects incoming sunlight at an angle of 90 degrees. Reflector 71 can be rectangular or oval, or any other desired shape which adequately reflects sunlight received from the sunlight concentrator. Upper elbow 70 is advantageously rotatable about axis **A-A** and is controlled by motor 75 and suitable linkages. The linkages can be belts, gears or other linkages as desired. Light exiting upper elbow 70 enters lower elbow 80 which is rotatable about axis **B-B**. Lower elbow 80 comprises a reflective surface such as a mirror which redirects the incoming sunlight downwardly through tube section 89 and through the roof. While the illustrated embodiments show natural sunlight being directed through a roof, this is solely for purposes of illustration. The advantages of the present invention can be enjoyed with systems that direct sunlight outside of a building or into other areas where illumination is desired. Lower elbow 80 is also advantageously rotatable around axis B-B and is controlled by motor 85 which is linked to lower elbow 80 by suitable linkage. The combined effect of the rotation of upper elbow 70 and lower elbow 80 permits the sunlight

effect of the rotation of upper elbow 70 and lower elbow 80 permits the sunlight concentrator to track the sun through any position in the sky while always directing the sunlight down tube 89. In this illustrated embodiment tube 89 directs the concentrated sunlight through roof 88 into a light blender. Tube [98] 89 can, for example, be formed of a structural material such as aluminum and preferably has an internal surface which is highly reflective.

Page 14, paragraph 2:

Fig. 13 is a portion of a blender box. The circle on the right is the connector [port for] 105 to an artificial light source 95. [This input 98 comprises] This connector 105 holds a light baffle 99 which reflects light back into the bulb in order to prevent the bulb from overheating the light distributor element in the light distributor tube. This light baffle 99 is particularly useful when using distributor tubes of the type shown in U.S. Patent No. 6,014,489 which comprise a gradually tapering light distributor for reflecting light out of the distributor tube. Figs. 34a through 34d provide a representation of a light distributor tube 800 connected to an artificial light source 810 by a silicone ring 805. Figs. 34b, 34c and 34c are cross-sectional views taken along lines BB, CC and DD, respectively. These cross-sectional views show the relatively increasing cross-section of light distributor 820 of this illustrated embodiment as the light distributor gradually intersects more of the light beam along the length of the distributor tube 800 as the light beam travels away from the artificial light source [800] 810. The baffle 99 is designed to prevent the heat from the artificial light source from overheating or burning the distributor 820 if this type of light

distributor tube is utilized. Other shapes and sizes of baffles can be utilized without departing from the scope of the present invention in order to accommodate different sizes and shapes of light distributors and/or light distributor tubes.

Paragraph 3, page 19:

Fig. 26 illustrates another device for collimating light from an artificial light source comprising an elliptical reflector 271 and a parabolical reflector 272. According to this embodiment of the present invention, the illuminated arc of the light source is positioned at the first focal point 273 of the elliptical reflector and the parabolical reflector is positioned such that its focal point is common with the second focal point 274 of the elliptical reflector. In the manner illustrated in Fig. 26, light emanating from the arc at the first focal point 273 which strikes the interior reflective surface of the elliptical reflector [272] 271 passes through the second focal point 274 of the elliptical reflector/parabolical reflector, then strikes the interior surface of the parabolical reflector and exits as a collimated beam of light. Fig. 27 illustrates this improved artificial light source connected to a light distributor tube.

Second paragraph, page 20:

Figs. 28 and 29 illustrate another aspect of the present invention which is designed to improve the even distribution of light from an artificial light source. When light is directed from a simple parabolic reflector such as the one shown in Fig. 29 connected to a light distributor tube, in the area immediately next to the light source, it is common to

have intensity peaks. It has been found that a more even distribution of light emanating from the light distributor tube can be obtained by adding a mirror film 282 to the end of the light distributor tube proximate the artificial light source in the manner illustrated in cross-section in Fig. 28. This cross-sectional view of a light distributor tube section comprises a rigid polycarbonate clear tube 283. The mirror film 282 extends only from the point proximate **[D]** the artificial light source or about 30 inches. The mirror film is bonded to a lexan suede film 284. In the same manner, beyond the mirror film, a 3M light enhancement film designated 3635-100, is bonded to the same lexan suede film 284. Distributor 285 is not covered with inner lexan HP92W film 281. **[**Below the mirror film is a light enhancement film, for example, a lexan film 284. The mirror film may comprise a silverlux film available from 3M. The light distributor 285 can comprise a film available from 3M designated 3635-100 light enhancement film on suede lexan. Distributor 285 is not covered with the HP-92W lexan film.**]** Light is emitted from this distributor tube in the area designated by the arc **E** at the bottom of the tube. Light is emitted from this distributor tube in the area designated by the arc E at the bottom of the tube.

Paragraph 2, page 22:

While the illustrated embodiments of the present invention show beams of sunlight passing generally vertically through the roof of a building, it is also within the scope of the present invention to pass sunlight through a roof on an angle. The embodiment of the present invention shown in Fig. 33 is similar to the embodiment shown in Fig. 30 wherein a pivotal and rotatable reflector 710 reflects light to a large parabolic reflector 730

and into a smaller parabolic reflector 740 which then sends the resulting collimated, concentrated beam of sunlight through the roof 701 on an angle into the building where it encounters reflector 750 and is then **[director]** <u>directed</u> into either light distributor tubes or blender boxes for possible mixing with artificial light.

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